

EPISODE SIXTY-THREE OF "ARMED WITH SCIENCE: RESEARCH AND APPLICATIONS FOR THE MODERN MILITARY," A DEPARTMENT OF DEFENSE WEBCAST SUBJECT: MALARIA RESEARCH PROGRAM PRESENTER: COLONEL CHRIS OCKENHOUSE, M.D., DIRECTOR, U.S. ARMY MALARIA VACCINE PROGRAM, WALTER REED ARMY INSTITUTE OF RESEARCH MODERATOR: JOHN OHAB, PH.D. TIME: 2:00 P.M. EDT DATE: WEDNESDAY, APRIL 14, 2010

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(Intro music begins.)

ANNOUNCER: "Armed with Science: Research and Applications for the Modern Military" is a weekly Webcast that discusses cutting-edge science and technology and how they apply to military operations.

Each week we will interview scientists, administrators, and operators to educate and inform our listeners about the importance of science and technology to the modern military.

(Intro music ends.) MR. OHAB: Good afternoon and welcome to episode number 63 of the "Armed with Science" podcast. Today is Wednesday, April 14th, 2010. I am Dr. John Ohab at the Office of the Assistant Secretary of Defense for Public Affairs.

I'm joined today by U.S. Army Colonel Chris Ockenhouse. He's the director of the U.S. Military Malaria Vaccine Program at the Walter Reed Army Institute of Research.

Colonel Ockenhouse will discuss the military efforts to fight the spread of malaria. This includes vaccine research, drug development, and diagnostics as part of a broader effort by the Walter Reed Army Institute of Research to support the health and medical readiness of the U.S. military personnel, as well as other global health efforts.

Colonel Ockenhouse, it's great to have you on the program today. Thanks for being here.

COL. OCKENHOUSE: Well, thank you, John, for inviting me. And it's my pleasure to assist and talk to your audience about the importance of malaria today worldwide and specifically for our troops serving overseas.

MR. OHAB: And it'll be the first time we talk about malaria, so I'm really looking forward to it.

Now, before we get into some of the Defense Department's efforts in malaria research, can you give our audience a little primer? What exactly is malaria?

COL. OCKENHOUSE: Oh, sure. Malaria is a parasitic disease. Many people have heard about it through the study of history. It's been important in the U.S. military since the Revolutionary War.

It's a parasite, the malaria parasite. It's caused by a genus called Plasmodium, a little technical for many people. And there's actually four different types of malaria parasites that can infect man.

Peculiar to this pathogen, or parasite, is that it's transmitted through the bite of a mosquito; a female mosquito is -- are mosquitoes that bite man. And the parasite which is in the salivary gland of the mosquito is transmitted into man upon the mosquito biting of the host.

And that parasite, very interestingly, goes to the liver and hangs out in the liver for five days. It doesn't do anything but multiplies in a liver cell. And then after about five days, it breaks out of the liver cell, goes into the blood and infects red blood cells.

And it's that process that occurs, every 48 hours or 72 hours, of multiplication within red blood cells that causes the symptoms of malaria. Now, many of the audience doesn't realize that malaria is a huge problem in the world today. Every day, right now in sub-Saharan Africa, 3,000 children die every day. And for a lot of people it's hard to get their numbers and appreciate the severity of the situation that it causes in sub-Saharan Africa.

If you just think about 10 747s crashing on a daily basis, day after day, gives you an understanding of the devastation that malaria, just in sub-Saharan Africa, causes children.

Now, malaria affects everyone, not just children. It affects anyone who is non-immune -- adults, travelers especially, and of course the U.S. military when they go into malaria-endemic areas.

MR. OHAB: Right. So why is the malaria research you're doing important to our soldiers?

COL. OCKENHOUSE: Well, it's really important because we've had the problem since the Revolutionary War. The Civil War. Parts of the United States in the early 1900s were uninhabitable because of malaria.

And actually malaria has changed by ecology over the years. It used to extend up into Canada. And pretty much every conflict the United States has been in, we've been faced with malaria.

It impacts our mission readiness. It impacts missions, whether they were in World War II, Vietnam, Korean War, and now in our efforts

worldwide in fighting terrorism, from Afghanistan to South America, Africa -- in AFRICOM, CENTCOM, SOUTHCOM. It affects our sailors, Marines, Army personnel worldwide.

MR. OHAB: So how are the soldiers actually being exposed to malaria?

COL. OCKENHOUSE: Well, we've recognized the importance of malaria in affecting our military operations. And we apply certain measures in order to combat the infection -- very simple things, like insect repellent, camouflage face paint that has the repellent in it.

We have uniforms that are impregnated with insecticides, the permethrins which repel mosquitoes. We can use simple things when we're on deployment like bed nets. Now, we understand that a lot of times our personnel don't use that because of operational constraints.

And finally, one of the important measures to prevent malaria right now is what we call chemoprophylaxis. It's a malaria pill. It's not ideal; it has to be taken every day, usually.

And as with any human nature, soldiers, when they don't feel sick, don't feel they need to take medicine. And that's why -- when we get into problems, when we're not taking our chemoprophylaxis daily. MR. OHAB: Now, as I mentioned earlier, you are the director of the U.S. Military Malaria Vaccine Program. Can you describe for us the Defense Department's activities in the area of malaria research?

COL. OCKENHOUSE: Sure. Our area of research is three-pronged. Diagnostics -- it's important to find the malaria parasite in the blood of an infected serviceman or servicewoman.

We also have a large program in vaccines. And a vaccine is meant to prevent infection, and I can talk about that in a few minutes.

And then we also have an anti-malarial drug program to also prevent infection, but also to treat those who are -- soldiers, sailors, airmen, Marines -- who come down with the infection.

And specifically it's a rather daunting task today, because the United States has no good anti-malarial to treat severe disease. So if you're at risk for dying of malaria, there are very few options on the table.

But I can talk about that in a little bit, because the WRAIR -- which is an acronym for the Walter Reed Army Institute of Research -- is developing a very effective medication for severe malaria.

MR. OHAB: That'd be great. But first, can you give us a sense for how big this research endeavor is? What countries are you working with?

COL. OCKENHOUSE: So we have a large program in house, our Institute, which is also with the Naval Medical Research Center here in Silver Spring, Maryland.

We do a lot of research, what we call early-stage basic research, and early-stage development right here in the Institute. We even have our own clinical trials center here.

But we also then work overseas. And one of the great overseas laboratories, which are an extension of the WRAIR, include our labs in Kenya, our laboratory in Thailand. We work in Tanzania, in Mali, Ghana, South America in Peru. So we kind of work in very many areas. We are ambassadors there and we are there at the request of the U.S. Embassy and our foreign partners. And we're there to help them test malaria drugs, vaccines, and diagnostics.

MR. OHAB: So you're doing all the way from basic to clinical research. What kind of scientific disciplines do you draw from?

COL. OCKENHOUSE: Well, we draw from pretty much -- we use the most advanced scientific tools right now -- molecular biology, things called omics, like genomics or proteomics -- because it's important for us to find the target. We have to find a target on the malaria parasite that we can aim our drugs and our vaccines against.

So let me -- if I can, I'd like to give you an example in vaccine development where we're particularly proud, is that we helped to develop a malaria vaccine. It's called RTSS. We've been working on it for 15 years. And a lot of medical research takes a long time. It's a lot of money, a large amount of cost.

And one thing we're particularly proud of is -- so if we get a vaccine that doesn't reach the mission requirements for the military -- and our mission requirements are very strong and robust, around 80 percent protection is what we need.

But we have developed a vaccine with GlaxoSmithKline pharmaceutical company, also with the support of the Bill and the Linda Gates Foundation and the Malaria Vaccine Initiative, to help co-develop a vaccine here that shows about 50 percent efficacy. That means it's effective in about 50 percent of the individuals, giving complete protection against malaria.

Now, while that's not good enough or high enough for the military, we are particularly proud that there is a dual use. And this is a dual use for something good for mankind and global public health.

Because right now this vaccine is being tested in 11,000 infants in sub-Saharan Africa at 11 different countries. And it should be ready for licensure in the year 2012.

And the WHO, which is the World Health Organization, anticipates that this vaccine, which is a first-generation vaccine, could save hundreds of thousands, if not millions, of lives of children.

So this is one of the spin-offs of the investment that the Department of Defense has put in to fund what we do essentially here at WRAIR and on the Navy side to benefit our soldier, but also has a great benefit for global public health.

MR. OHAB: Now, is this vaccine the only candidate, or are there others?

COL. OCKENHOUSE: Oh, we have a number of other -- candidates. Our strategy is one of risk mitigation. When something -- always be prepared, because science sometimes throws a roadblock in your path. And we're developing and we're going to start testing, actually, next -- in June of 2010, in two months -- a first malaria vaccine against Plasmodium vivax.

This is a different type. This is a malaria that won't kill you, but certainly can make you feel very, very ill. And it's the -- vivax malaria is the type of malaria that occurs throughout the world. It often can recur many times in a single individual.

And I just want to kind of give you something, a nuance, because people may not realize that when we test malaria vaccines, we have to find out how well they work. And in order to determine that, we use what we developed here 15, 20 years ago at WRAIR. It's call the human malaria challenge model.

As we get volunteers. These are volunteers from the community, military volunteers, fellow Army and Navy officers, who come in, who agree to enroll under informed consent in a clinical trial, get vaccinated, and then we expose them to the bite of five malaria- infected mosquitoes.

And two weeks later -- we follow them very closely -- we put them in a hotel; they can come and go as they want, but we have to -- we look for that malaria parasite every single day in the blood.

And what our goal is, is to not find any malaria parasites, because then we would know that the vaccine is working. If do find the malaria parasite, we treat them promptly and they return to duty or go back to work or school or wherever they go.

So that human challenge model, if I may, is one of the most important advances that we have made within the military, because it allows us to test a lot of drugs, a lot of vaccines, in a short period of time, without spending the tens of millions of dollars it would require to test each and every vaccine in the field, or in a separate country.

But ultimately, whatever we pass through here has to go to the field. So it's a long, laborious process. It requires an enormous amount of money. And that's why in today's partnerships throughout -- in science and throughout medical research, the DOD is not the only sponsor of malaria research.

And so we're looking for funding from other sources as well to help support what we do here.

MR. OHAB: Now, you talked a bit about the vaccine candidates. How about malaria drugs? Can you explain some of the malaria drugs that the Defense Department has created? COL. OCKENHOUSE: Sure. A drug actually can be used for two purposes. And our primary purpose here is to find a drug, which is a little bit different than a medication, that you can take on a daily or a weekly or maybe even a month basis, to prevent malaria.

It's a logistical challenge, because you have to have the logistics to get the drug out to where it needs. There's always a cold chain; it has to -- you can't have drugs that disintegrate in the hot desert.

But we have -- throughout the history of malaria drug development in this country, the U.S. military, specifically the U.S. Army, has been there in evaluating every single drug. So if the -- our older vets know Chloroquine from Vietnam and Korea; the Primaquine, which was developed in Korea; and all the way up to Mefloquine and Malarone, have had some developmental aspect here at WRAIR.

Most exciting -- or actually, most serious -- is that the United States doesn't have any anti-malarial drugs for severe disease. And unfortunately, sometimes infections can multiply. The parasite can multiply so rapidly that there is not an effective treatment, and that patient is at risk for dying.

And when that happens, you need a very highly effective anti-malarial, usually delivered intravenously. And we really don't -- this country really doesn't have an effective anti-malarial.

I think for the past four or five years, WRAIR has embarked on an ambitious endeavor and are developing the first FDA-licensed anti-malarial to be delivered intravenously. It's called Artesunate.

And interestingly enough, this drug, in a more crude form, has been used by the Chinese for thousands of years, because it comes from a herbal plant. And the Chinese, centuries ago, recognized that the ingredients in this herbal plant were very effective at reducing the fever and killing malaria parasites.

So Artesunate is used around the world today in the form of a tablet. The U.S. military and Walter Reed Army Institute of Research several years ago embarked on an intensive research and development program. And has successfully now been able to manufacture Artesunate. It is in the final stages of development -- or, for clearance by the FDA.

But right now, this drug is available for compassionate use throughout the United States for military and civilian alike, and has been -- it's actually led to the saving of several lives, both military and civilian, in the United States.

So we are at the forefront of many endeavors in drugs and vaccines. MR. OHAB: Now, as you probably know, April is Earth Month. And I'm sort of curious how one of these malaria vaccines would be positive for the environment.

COL. OCKENHOUSE: Yes. Well, it's really important. For years it was what are the prongs of control of malaria? And I look at the -- there are four pillars.

One would be a vaccine, when we have it. One would be drugs. One would be bed nets. Bed nets used throughout the world today are very effective at reducing malaria, and they have minimal impact or have no adverse impact on the environment.

One of the great -- and I would say great insecticides -- is DDT. And I say it's great because when it's used inappropriately it can have a harmful effect, but when it's used appropriately -- spraying on the insides of a mud hut in Tanzania or in Western Kenya, where we work -- will actually kill the malaria parasite and have absolutely no harm on the environment at all.

But ultimately, our goal and the goal that Bill Gates and his foundation has, is the elimination -- first, the control, then the elimination -- and then eradication of malaria.

And an effective vaccine that we're developing here will hopefully reduce the need for insecticides anywhere. But then, there are too many kids that are dying of malaria, and we have to balance the severity and the mortality of these children. But we never, never want to impact of adverse events on the environment.

So I think this is a win. I think malaria control efforts are recognized throughout the world. Even Bono, the rock star, is a great proponent. And it's come to the fore at the G-8 summit, in the last several.

So the DOD should be particularly proud that it is stepping up to the plate and leading the world's efforts on this disease.

MR. OHAB: Now, in addition to being a colonel in the U.S. Army, you also have an M.D. and a Ph.D., so both medical and research doctorates.

Can you tell us a little bit about your background and how you got to be in your current position?

COL. OCKENHOUSE: Oh, sure. Well, you know, I'm passionate about what I do. It's like one of those things, when I was a kid I always read books on explorers in Africa. And it was like malaria was one of those things -- like David Livingstone always got and they always died from, or people would die from. And I became obsessed about this parasite. I thought it was fascinating. Part of it was the adventure; part of it is the adventure of going overseas. And I was very curious as

a young boy. I loved science and I loved medicine, and I thought that the -- interaction of the two, of medicine and science.

So I went on and one of the great things that I was offered was a scholarship to go to medical school by the Department of Defense. The U.S. Army Health Professions Scholarship Program. I could never have gone to medical school without it, and it's one of the great investments for me. I hope this has been a great investment for the DOD.

But after that, I trained at Walter Reed Army Medical Center in medicine and then infectious disease. Had a great tour of duty in Korea, where I was taking care of soldiers and their families.

I even actually saw an occasional case of malaria in Korea. And it's now recurred again.

And I have a Ph.D. as well in immunology and parasitology. So I was able to harness the medicine and the scientific, and now I'm proud to be a part of a great group of people up here at the Walter Reed Army Institute of Research.

We are a subordinate command under the U.S. Army Medical Research and Materiel Command up at Fort Detrick. And it's a great place to work, and we have great opportunities for young scientists and officers. And even high school students come here in the summer to participate in our activities.

MR. OHAB: Now, Colonel, as we wrap up today's program, do you have anything else you'd like to add or is there anything you think the audience should know about malaria?

COL. OCKENHOUSE: Well, John, I just wanted to take this opportunity to thank you and your group for hosting me. It's been my pleasure. I hope I was able to impart a little bit of knowledge about why malaria is still important today. It has not disappeared.

Oftentimes I get confronted that, oh, you work on malaria, hasn't that -- I thought we eradicated that years ago. Unfortunately, that's not the case, and the U.S. military, whether we're in Haiti or Liberia -- just yesterday I heard about National Guard forces in Ghana infected with malaria -- or Benin or Republic of Korea or Afghanistan.

We're there on the front to fight this disease, and I appreciate the support from the DOD and thank you for inviting me.

MR. OHAB: Oh, it's been a real pleasure.

Our guest today is U.S. Army Colonel Chris Ockenhouse. He's the director of the U.S. Military Malaria Vaccine Program at the Walter Reed Army Institute of Research. I really do appreciate your time today. Best of luck, and I hope we can reconnect as your research develops down the road.

COL. OCKENHOUSE: Oh, thank you very much, John. Good-bye.



MR. OHAB: Good-bye.

Thank you, listeners, for tuning in to today's "Armed with Science" podcast. I am Dr. John Ohab, and you've been sciented.

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